REMARKS

Claims in the Case

Independent claims 1, 7, 11, 15, 22, 28, 32 and 34 have been amended. The limitations of claim 4 have been added to claim 1, and the limitations of claim 25 have been added to claim 22. Claim 4 and 25 have been canceled. Claims 1-3, 5-24 and 26-36 are now pending in the case.

Double Patenting Rejection

The Office Action rejected the pending claims under grounds of obviousness type double patenting over U.S. 6,381,647. Applicant has concurrently filed a Terminal Disclaimer to obviate this rejection. Withdrawal of the rejection is respectfully requested.

Rejection of the Pending Claims

The Final Office Action rejected the pending claims as obvious over U.S. 5,604,867 (Harwood) in view of U.S. 5,638,518 (Malladi). Applicant has amended the claims to clarify the claimed invention. Applicant respectfully traverses the rejections.

Harwood and Malladi are directed to the use of **existing** Fibre Channel protocols, including **existing** frame structure protocol definitions, for handling multicast communications (Harwood) and for handling node loop (NL) control (Malladi). The present invention is directed to improving frame based protocols, such as Fibre Channel protocols, by **adding** unique and advantageous frame types directed to "**levels of time sensitivity with respect to delivery of information within the frame**."

More particularly, the present invention relates to improved communication techniques for handling the transmission of time sensitive data in a Fibre Channel communication network and, more particularly, in such a network connected in a loop topology. Unlike the prior Fibre Channel solutions and the protocol itself, the present invention allows deterministic transfer of data to be designated at the time data is delivered and allows devices in a loop topology to transmit and receive information almost simultaneously. Such operation stands in contrast to traditional loop based network communications where transmission of information by one node unpredictably or randomly halts transmission by any other node until the transmission is complete, preventing on-time delivery and synchronization of data from a plurality of originating sources. [See, Specification, paragraph 0033.]

Harwood is directed to limiting the bandwidth utilized by standard multicast Fibre Channel communications. As such, a normal rate limit is applied; however, a burst rate limit is allowed in certain

instances. [Harwood, Abstract.] Thus, two transmission rates appear to be contemplated with respect to multicast communications. However, Harwood does not appear to be concerned with modifying the Fibre Channel data frame protocols to improve time sensitive data communications.

Malladi is directed to a node loop (NL) port core for handling standard transmissions according to the Fibre Channel communication protocols. [Malladi, Abstract.] For example, the core follows "established Fibre Channel arbitration rules" in handling communications among attached devices. [Malladi, Abstract.] As noted at the bottom of Column 2 of Malladi, the Fibre Channel Standard level FC-2 defines the frame structure. As noted in the Office Action, Malladi discusses the Fibre Channel frame structures in Column 3. However, the frame type addressed at Column 3, Line 30, of Malladi appears to be directed to data routing or destination purposes. This can be seen from the discussion of routing control bits in the alternative frame format discussed at Column 3, Lines 51-62, of Malladi. Malladi correlates this routing information to its "frame" data type as shown in Columns 13-14 where Malladi keeps track of a 3-bit FD_TYPE[3:0] parameter representing a "Device, Video or Link" frame data type as represented by the R_CTRL (routing control) data in the frame header. As stated in Malladi, these signals "can be used to differentiate between various frame data types, primarily for the purpose of steering the data after it leaves the core." [Malladi, columns 13-14.] It is also noted that TYPE is listed, in addition to R_CTRL, as a portion of the frame header information within this alternative frame format. [Malladi, column 3, line 47.]

The creation and use of frame types related to "**levels of time sensitivity with respect to delivery of information within the frame,**" as required by the present invention, differs from the use of "frame type" data in Malladi that relates to routing or destination information in the standard Fibre Channel frame structure. Rather than rely upon routing control (R_CTRL) data within the frame as set forth by the Fibre Channel standard [see Malladi, column 3, lines 55-62], the present invention provides a solution that defines and takes advantage of new and unique frame data types that directly relate to delivery priority with respect to time sensitivity of the data that is contained within the frame. For example, type fields within the frame header of a data frame can be used to store one of the plurality of data frame types directed to time sensitivity, according to the present invention. The advantages of the data frame types of the present invention are discussed, for example, in the Specification at paragraph 0037 with respect to FIG. 2:

> [0037] According to the invention, a plurality of types of frames are available. Example types of frames include frames used to transfer control information only, frames providing transfer of basic data, frames to transfer video data, and frames establishing a Fibre Channel link; however,

> **other types of frames are also utilized**. **Each different type of frame is uniquely identified by frame header 32. Frames 22 are broadly divided into two categories: asynchronous frames and isochronous frames. Isochronous frames** are generally used to transfer user data and **provide deterministic transmission**. Asynchronous frames are generally used for purposes of network initialization, determination of which node 12 will serve as master node 16, maintenance, and repair. **Asynchronous frames** are transmitted only when isochronous frames do not occupy all available bandwidth. The time for asynchronous transmission from a given node 12 is **not predetermined, deterministic, or periodic**, but, as described above, is bounded by the time period T. Asynchronous transmissions end at the beginning of the next integer multiple of time T. The type of frame designated in frame header section 32 indicates whether frame 22 is asynchronous or isochronous. Transmission of isochronous frame types is referred to as isochronous service. Transmission of asynchronous frame types is referred to as asynchronous service.

[Specification, paragraph 0037 (emphasis added).] The Specification proceeds to discuss an example distribution technique for transmitting frames based upon the time-sensitivity-based data frame types in paragraphs 0041-0050 with respect to FIG. 3. [Specification, paragraphs 0041-0050.] The scheduling of these data transmissions are further discussed, for example, with respect to FIG. 6 where sixteen different data frame types are shown. [Specification, paragraphs 0082-0101.]

In short, the present invention provides for the use of **unique and advantageous data frame types** to define and control data transmission priority in terms of **time sensitivity of the data to be transmitted**. These unique data frame types and associated use are not taught or suggested by Harwood or Malladi, which utilize standard Fibre Channel protocol definitions. Thus, the advantageous solution of the present invention is not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

The language of the independent claims 1, 7, 11, 15, 22, 28, 32 and 34 will now be discussed.

Independent claim 1, as well as dependent claims 2-3 and 5-6, require the use of a frame that includes a frame type where "the frame type in turn identifies a priority level representing one of a plurality of levels of time sensitivity with respect to delivery of the information within the frame," and the frame type is used in scheduling transmission priorities. Thus, claims 1-3 and 5-6 are not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

Independent claim 7, as well as dependent claims 8-10, require first and second frames that have a first and second maximum size and that include frame types where "the frame type in turn identifies a priority level representing one of a plurality of levels of time sensitivity with respect to delivery of the

information within the frame." In addition, the frame type and the size are used in the first and second frames for transmission at a first and second scheduled time. Thus, claims 7-10 are not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

Independent claim 11, as well as dependent claims 12-14 require first and second frames that include different frame types where "the frame type in turn identifies a priority level representing one of a plurality of levels of time sensitivity with respect to delivery of the information within the frame," and the frame type is used in scheduling the frames at a first and second rates, respectively. Thus, claims 11-14 are not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

Independent claim 15, as well as dependent claims 16-21, require the use of frames that include frame types where "the frame type in turn identifies a priority level representing one of a plurality of levels of time sensitivity with respect to delivery of the information within the frame." The frame type is then used in building transmission schedule tables. Thus, claims 15-21 are not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

Independent claim 22, as well as dependent claims 23-24 and 26-27, require the use of frames that include frame types where "the frame type in turn identifies a priority level representing one of a plurality of levels of time sensitivity with respect to delivery of the information within the frame," and the frame type is used in scheduling transmission priorities. Thus, claims 22-24 and 26-27 are not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

Independent claim 28, as well as dependent claims 29-31, require the use of frames that include isochronous and asynchronous frame types "wherein the frame types for the frames each identify a priority level representing one of a plurality of levels of time sensitivity with respect to delivery of information within the frame, the frame types comprising at least an isochronous frame type designating time delivery sensitive information and an asynchronous frame type designating time delivery insensitive information." The frame types are then used in scheduling transmission priorities. Thus, claims 28-31 are not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

Independent claim 32, as well as dependent claim 33, require the use of frames that include isochronous and asynchronous frame types "wherein the frame types for the frames each identify a priority level representing one of a plurality of levels of time sensitivity with respect to delivery of

information within the frame, the frame types comprising at least an isochronous frame type designating time delivery sensitive information and an asynchronous frame type designating time delivery insensitive information." The frame types are then used in determining transmission schedule tables and transmission rates. Thus, claims 32-33 are not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

Independent claim 34, as well as dependent claims 35-36, require the use of frames that include isochronous and asynchronous frame types "wherein the frame types for the frames each identify a priority level representing one of a plurality of levels of time sensitivity with respect to delivery of information within the frame." The frame types are then used in determining transmission schedule tables and transmission start times. Thus, claims 34-36 are not taught or suggested by Harwood and Malladi whether they are considered alone or in combination.

In summary, Applicants respectfully assert that Harwood and Malladi, either alone or in combination, do not teach or make obvious the limitations required by the amended claims.

Conclusion

In view of the foregoing, it is respectfully submitted that the pending claims are in condition for allowance. Accordingly, favorable reconsideration and Notice of Allowance are respectfully requested.

The Examiner is invited to contact the undersigned at the phone number indicated below with any questions or comments, or to otherwise facilitate expeditious and compact prosecution of the application.

Respectfully submitted,

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